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ABSTRACT

It was hypothesized that receiving a problem of the day would result in higher mathematics scores on the Ohio Ninth Grade Proficiency Test. An experimental group consisting of 19 students received a problem of the day treatment every day during the 5 month period. The 19 students in the control group received no special treatment. Test scores of the students in the control group were compared with the test scores of the students in the experimental group for both the October 1997 and March 1998 tests. No significant differences in test scores were discovered for either group. (Contains 36 references.) (Author/NB)

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Effect of Problem of the Day on Ohio Ninth Grade Proficiency Test Mathematics Scores

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A Thesis

Presented to

The Faculty of the Master of Arts Degree Program

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In Partial Fulfillment

of the Requirements for the Degree

Master of Arts in Education

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by

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This thesis submitted by Catherine J. Heiney has been approved meeting the research requirements for the Master of Arts Degree.

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ABSTRACT

It was hypothesized that receiving a problem of the day would result in higher mathematics scores on the Ohio Ninth Grade Proficiency Test. The experimental group consisting of nineteen students received a problem of the day treatment every day during the five month period. The nineteen students in the control group received no special treatment. Test scores of the students in the control group were compared with test scores of the students in the experimental group for both the October 1997 and March 1998 tests. No significant differences in test scores were discovered for either group.

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CHAPTER 1

INTRODUCTION

PURPOSE OF THE STUDY

In the state of Ohio, all high school students must pass the Ninth Grade Proficiency Test in order to receive a high school diploma. This test includes sections in the areas of reading, mathematics, citizenship, writing, and science (Lanese, 1992; Ohio State Legislative Office of Education Oversight [Ohio State LOEO], 1993). Because the mathematics portion of the test is generally the area with the highest percentage of failures (Tack, 1995), most schools search for intervention strategies to aid students in passing the test (Ohio State LOEO, 1993).

Literature from the Ohio State LOEO (1993) presents several intervention and remediation strategies. Primarily these methods are condensed and intensive workshops or study sessions rather than being an ongoing process incorporated into the regular classroom such as the way the problem of the day is intended to be.

RESEARCH QUESTION

Does a problem of the day have any effect on the math scores of the Ohio Ninth Grade Proficiency Test?

HYPOTHESIS

The null hypothesis (H_0) is that the same percentage of students who have been given a problem of the day will receive a passing score on the mathematics portion of the test as those students who have not received a problem of the day. The alternate hypothesis (H_1) is that a higher percentage of students who have been given a problem of the day will pass the mathematics portion of the test than those students who have not received a problem of the day.

LIMITATIONS

The subjects in this study are from a poor, rural setting. Although this study may be relevant to other areas in Ohio with similar characteristics, it may not be transferrable to the more affluent suburban or urban areas in Ohio. Funding is not equitable in Ohio as in other states, which creates differences in the way programs such as intervention and remediation for the proficiency test are operated.

ASSUMPTIONS

One thing in this study that should be assumed is that the subjects (the students) are like students in other parts of Ohio. Another assumption is that the teachers are all certified in their areas and are essentially the same as

other teachers around the state. An additional thing to be assumed is that the proficiency tests are all very similar, without one test being more difficult than another one given at a different time of the year.

DEFINITIONS OF TERMS

Intervention - how schools help students prepare for the proficiency test (Ohio State LOEO, 1993).

Remediation - how schools help students prepare for the proficiency test after failing it at least once (Ohio State LOEO, 1993).

Problem of the Day - a problem on the board for students to do at the beginning of every class period to help them prepare for the proficiency test.

Learning outcomes - "a learning outcome identifies a discrete set of facts or skills to be measured by one or more test questions" (Ohio State LOEO, 1993, p. 9).

Manipulatives - a hands-on technique where students are given concrete items to work with that provide tangible pictures of sometimes abstract ideas (Cain-Caston, 1996).

"At-risk" students - students with characteristics of "poor self-concept; poor academic performance, high absenteeism, and discipline problems; low aspirations and parents or guardians with low expectations; low family socioeconomic

level; nontraditional family life...; and inadequate goals and lack of future orientation" (Vatter, 1992, p. 292).

IMPORTANCE OF THE STUDY

This study is important because all Ohio students must pass the Ninth Grade Proficiency Test in order to graduate from high school. Schools spend large amounts of money on interventions in order to help students pass the test. This study was to prove that a problem of the day increases students' chances of passing the proficiency test which might allow more money to be spent on other areas of importance.

CHAPTER 2

LITERATURE REVIEW

INTRODUCTION

This literature review surveyed the area of additional mathematics remediation beyond the textbook as preparation for the Ohio Ninth Grade Proficiency Test along with methods and teaching strategies for improving test scores.

BACKGROUND

In 1987 the Ohio Legislature passed Substitute House Bill 231 mandating that all Ohio students pass a Ninth Grade Proficiency Test in order to receive a high school diploma. Those not passing all subject areas of the test would receive a certificate of attendance rather than a high school diploma (Lanese, 1992).

Beginning with the ninth grade class in 1990-91, all students were required to pass minimum proficiency tests in the areas of reading, mathematics, citizenship, and writing. A test for science was added for ninth graders beginning in 1995-96 (Ohio State LOEO, 1993). If necessary, students are given two opportunities each year during their four years in high school to pass all areas of the test they have not yet been successful in passing (Moore & Robinson, 1992). All public school students in the state must participate in the

proficiency test with exemptions given to students with disabilities whose Individualized Education Programs specifically excuse them from taking it (Ohio State LOEO, 1993).

The rationale behind the proficiency test is to maintain minimum standards and to guarantee certain skills for all Ohio public school graduates (Lanese, 1992).

DESCRIPTION OF THE PROFICIENCY TEST

The mathematics portion of the Ohio Ninth Grade Proficiency Test consists of forty-five questions, with five of those being sample questions being tested for future use. Students have no knowledge of which five are the sample questions; therefore, they are encouraged to do their best on all questions. Two and one-half hours are allowed to complete this portion of the test and only one of the five tests is given per day (Ohio Ninth Grade Proficiency Test Instruction Book, 1997).

Passing standards for this segment of the test are twenty-four correct answers out of forty questions for a 60% average (Ohio State LOEO, 1993).

With sixteen learning outcomes in mathematics, questions from several different areas are used to assess total math ability. Arithmetic encompasses 30% of the test, while measurement takes up 25%, and geometry, data analysis,

and algebra are each 15% of the test (Ohio Department of Education, 1989).

VARIABLES AFFECTING TEST SCORES

Correlation between reading and math

Research completed by Tack (1995) indicated that after the proficiency test was given for the first time in 1990, the mathematics portion had the highest percentage of failures. Another result of this same research showed a strong correlation between the results of the math test and the findings of the reading test. This could be due to the fact that the mathematics segment of the test consists largely of word problems.

Math Vocabulary

The vocabulary used in the mathematics portion seems to be another problem. Many students do not understand the language. They can do the computation, but when faced with a word problem, they do not understand what is being asked or how to ask for help (Gardner, 1992).

Content on the test not yet taught

According to Chandler and Brosnan (1995), as well as Hull and Tache (1993), material on the test should match the content taught in classrooms. This can be difficult for

many basic level courses that do not include algebra or geometry in their course of study. How can these students be expected to know things they have yet to be taught?

Research performed by Chandler and Brosnan (1995) indicated a huge discrepancy between the content of several math textbooks when compared to the content on the proficiency test, with the largest differences being in the areas of measurement and algebra. This study placed a value on the number of test items in a particular area and also the number of pages a textbook used to cover this topic. Their results clearly showed a mismatch between the textbooks studied and the mathematics portion of the proficiency test. Based on this information, Chandler and Brosnan (1995) indicated a need for supplemental activities to try to make up for these inadequacies.

INTERVENTION STRATEGIES

In the seven years since inception of the proficiency test, schools in Ohio have attempted many intervention strategies as a way to prepare students to pass the test. Some ways schools use to prepare their students for testing include:

- intensive review of subject matter;
- Ohio Department of Education information booklets given to students;

- adjustments to the current curriculum to include test preparation;
- administration of practice tests;
- training on test-taking skills; and
- after-school study sessions (Ohio State LOEO, 1993, p. 17).

Remediation endeavors used by schools for students who must repeat portions of the test include:

- before- or after-school subject remediation;
- study hall subject remediation;
- weekend classes, both in subject matter and test-taking skills;
- summer classes, both optional and mandatory;
- required courses scheduled during regular school days;
- community-assisted tutoring and tutoring by teachers; and
- computerized assistance and learning packets (Ohio State LOEO, 1993, p. 17).

LIMITATIONS OF THESE STRATEGIES

One of the biggest downfalls of many of these strategies is the lack of money needed to provide them (Ohio State LOEO, 1993). The majority of these services require teachers to teach outside the regular school day

necessitating additional funding for salaries in addition to materials and supplies.

Another pitfall of these strategies is the minimal participation of students. Not much success has been experienced in persuading students to attend these optional out-of-school sessions. Educators have tried to coax students to attend these sessions by offering food and transportation, but these attempts have been largely unsuccessful (Ohio State LOEO, 1993).

LIMITATIONS OF TRADITIONAL MATH TEXTBOOKS

In her article, Jan Mokros (1994) believes that textbooks are inconsistent with the standards set forth by the National Council of Teachers of Mathematics (1989). With the use of textbooks, students never have a chance to "gather, describe, summarize, and interpret real data for themselves" (Mokros, 1994, p. 61). Students are left with few opportunities to figure something out for themselves. According to Mokros (1994), much of math is the memorization of rules and if a student forgets a rule, he or she is in trouble. She also believes that textbooks provide no search for meaning nor do they require students to construct mathematical knowledge. Instead, through the use of textbooks, students learn that math is a "noncreative, stuffy, formulaic discipline filled with rules" (p. 61).

Despite these limitations, teachers mainly use the textbook approach because the identification of meaningful materials can be difficult, or their schools won't permit them to try anything different, or textbooks are aligned with specific standardized tests.

OTHER METHODS FOR IMPROVING TEST SCORES

Manipulatives

According to research by Althouse (1994), children who sit quietly have difficulty thinking and staying on task. Cain-Caston (1996) reports that children are best able to think and learn while manipulating objects rather than through the use of workbooks, drills, and memorization. The use of manipulatives makes math enjoyable for students as well as the teacher, instead of being thought of as boring as in past years. Research by Clements and McMillen (1996) has indicated that test scores have increased and attitudes toward math have improved through the use of manipulatives.

Interactive Workshops

In a study by Taylor and Walton (1997), a series of interactive workshops were used approximately one hour every day for two weeks as an intervention strategy to try to improve standardized test scores of elementary students. Through this workshop approach students learned to negotiate

the format of norm-referenced, multiple-choice tests. Active learning was used to construct their understanding. The curriculum was designed to coordinate with existing curriculum already in place. Coping skills and problem-solving strategies were taught to aid students in preparation for this type of test because according to Lewis (1995) "students' problem-solving abilities, however, are weak" (p. 72). The results of this workshop approach were that test scores improved significantly and reinforced the authors' belief that "the intervention did not 'teach to the test'; rather, children gained skills to more accurately reveal knowledge they already had" (Taylor & Walton, 1997, p. 69).

Technology

Van Horn (1997) presents several principles for improving test scores through the use of technology. He emphasized that in order to benefit from technology, one must maximize its usage. Students shouldn't be permitted to do trivial things on the computer. These kinds of things don't pay off at test time. Software should be used that allows students to practice more than one skill at once. Resources should be concentrated for those who need it the most rather than spreading it so thin that no one benefits. Lots of practice tests should be given so that students will

become familiar with the process. Students should be encouraged to have a good attitude at test time because they have had lots of practice on the computer.

Summer Math Institute

Although Jose Valdes never lived to enjoy the success of his dream, his vision lives on and at the time of this article, was in its eighth successful year of helping students master mathematics through a concentrated seven-week program. The Jose Valdes Summer Math Institutes in California have benefitted at least 4,800 minority students who have completed grades 6 through 8 and allowed them to get a head start on their high school studies through intensive math instruction. This program also included training for teachers, as well as education for parents, and a support program for students. Highlights of the program include motivational speakers, field trips, and tours of the college campuses to encourage students to want to go to college. The success of this program has seen not only improvements in math achievement, but also in student attitudes (Greene, 1996).

Using Standardized Test Results

Standardized tests are extremely costly. Many times results are never used except on a year-to-year basis.

Teachers and administrators are often judged by the performance of students on these tests. Funds are often allocated based on the results of these tests. Why then do teachers not take full benefit of these results to improve instruction? Possibly because test results are difficult and time consuming to read. Teachers need specific information such as deficiencies instead of grade equivalents. In a study completed by Whitehead and Santee (1994), an elementary school in Montana attempted to better use achievement test results by linking testing to instructional improvement. Using the Iowa Tests of Basic Skills, the school targeted student deficiencies (including average and above average students) and followed them from year to year in order to try to determine reasons for those deficiencies and to see how quickly they were able to overcome them. The data provided information that enabled teachers to help students improve those marked areas of deficiency. Noel (1994) suggests using test score results to begin intervention strategies as soon as possible to provide an adequate preparation period.

IMPACT OF TESTING ON TEACHING

A study by Herman and Golan (1993) has discovered that standardized testing impacts teaching heavily. Teachers are under pressure to raise test scores, particularly those

schools with a high minority population. Much time is spent in preparation for the test both by teachers and administrators. When teachers were asked, they felt that test scores were more affected by "instructional strategies and teacher effectiveness than by demographic changes, test/curriculum alignment, test-taking skills, textbooks, test administration practices, or school climate" (p. 806). Data also showed that teachers in low socioeconomic schools gave more attention to testing when planning their instruction and used more time in preparation for the test. These results were not surprising according to Scruggs, White and Bennion (1986) because research suggests that "lower SES students have lower test scores and benefit more than other students from test-wiseness training and coaching" (p. 469).

STANDARDIZED TEST SCORES AND ASSESSMENT

Research by Stiggins and Conklin (1992) indicated that standardized tests are not as important to high school teachers as they are to elementary teachers when it comes to assessment in their classrooms. Elementary teachers feel more pressure to align their evaluation devices with those of standardized tests.

ETHICAL ISSUES FOR IMPROVING TEST SCORES

Haladyna, Nolen, and Haas (1991) address ethical issues regarding the improvement of test scores. Various strategies have been put into either one category or the other. Among the methods considered ethical are "teaching students test-taking skills, checking answer sheets to make sure they are answered correctly, and encouraging students to try hard" (Urdan & Paris, 1994, p. 156). Strategies that are considered unethical include "teaching to the test, practicing with actual or similar test items, using commercial test-preparation materials, and dismissing low-achieving students from the test" (p. 156).

OTHER TEACHING STRATEGIES

Group Projects

Shearer and Quinn (1996) present various ideas for group projects as a non-traditional way of teaching mathematics. Through these projects, students research the lives of famous mathematicians, explore careers of interest, present projects on polynomial equations, and conduct surveys and present statistical results. These projects are displayed in poster form along with a one-minute presentation to the class. This method presents an alternative technique for evaluation in addition to tests and quizzes.

Terry Vatter (1992) agreed with the project approach to achieve success when working with "at-risk" (p. 292) students. Her strategy has been shown to improve the self-esteem of students through the successful completion of a project. All project work is through a hands-on approach and students are permitted to choose topics of interest to them. Throughout this project strategy, math skills are both utilized and improved upon by using supplemental material.

Invented Procedures

In an article by Carroll and Partner (1997), it is suggested that by encouraging children to invent their own procedures that are meaningful, their understanding of mathematics will improve. The authors present various ways to aid teachers who may be unfamiliar with this strategy: give students time to explore their own methods being sure to monitor to make certain their methods are correct; use manipulatives to aid student's thinking and in their choosing correct procedures; present problems that are meaningful and that can be applied to real life situations; and encourage students to share their methods, allowing them to learn from one another. Evidence suggests that conceptual approaches produce good achievement and save time in the mastery of computational skills.

General Mathematics

Gerver and Sgroi (1992) offer curricular alternatives for general mathematics courses as well as instructional strategies appropriate for teachers of these programs. The four curricula presented are thematic in nature. A simulation approach based on the rock-music industry has shown a greater improvement in math achievement and also in positive attitudes toward math compared to students receiving traditional instruction. A project-oriented course helps students gain proficiency by completing projects in which they have to demonstrate various math skills such as interior-design layouts or mechanical drawings. Through the use of a consumer-mathematics curriculum, older students are prepared to become problem-solving consumers in the American society learning such things as shopping, banking, income taxes, and budgets. A life-in-the-United-States theme crosses over into the area of social studies with a look at geography, culture, people, and landmarks. Instructional strategies appropriate for any course include: providing opportunities for students to read mathematics; creating discussion regarding comments or as a way to solve problems; showing how math is used in a variety of fields; taking field trips to see math in use; using manipulatives to allow students to discover math; modifying evaluation methods beyond tests and quizzes;

having an activity for students as soon as they enter the classroom such as a short quiz or problems of review; requiring students to keep a daily notebook of work; using cooperative groups and peer coaching to allow students to learn from one another; teaching students how to use a calculator wisely; utilizing available computers; and using team teaching if possible to allow students to benefit from the resources of two teachers.

Portfolio Approach

In response to a call for reform in education, Vermont education officials implemented the portfolio assessment approach for math and writing in the fourth and eighth grades. This approach emphasizes the areas of problem solving, reasoning, and communication. Math students might be asked to determine different ways to solve a problem, to make charts, and finally, to present the solution to the class. This strategy is more demanding on teachers because they not only have to be knowledgeable about the subject, but they have to be more aware of student understanding. Research shows that after four years in this program, average test scores have increased remarkably (Campbell & Deyette, 1995).

EFFORTS TO IMPROVE MATH ACHIEVEMENT

In an effort to improve math achievement, remedial measures are being used. In elementary schools, mathematics has been given a higher priority with a higher percentage of time spent on math than before. More emphasis is being placed on problem solving skills. Training for teachers is being offered. Projects and small group activities as well as the use of calculators and computers are being promoted. Also, the strategy of grouping students by ability is being tested. These measures have been shown only to have a limited impact on math achievement with the highest influence being socioeconomic factors and the fact that many students are weak in the basic concepts (Mullis, 1994). Suggestions for increasing math achievement include: giving timely follow-up support to students beyond what they learn in the classroom; making special efforts to motivate the low achiever by using peer tutors; and reviewing and strengthening the basics because mathematics is extremely sequential in nature through the use of self learning booklets or computers (Johsi, 1995).

MATH INTERVENTIONS FOR STUDENTS WITH LEARNING DISABILITIES

Moses, Kamii, Swap, and Howard (1989) believe that students with learning disabilities will benefit from a curriculum that includes the following four key points:

actual experiences and hands-on experiences such as field trips and manipulatives; active learning through the use of cooperative groups; participation in discussions that build communication skills; and a five-step student activity process beginning with physical activities, moving on to pictorial representation, then to "intuitive language" (p. 407) and "regimented language" (p. 407), and finally to symbolic representation. Fleischner and Manheimer (1997) suggest following a particular sequence no matter the age of the students or the topic. The first level is concrete representation or the use of manipulatives. The next phase is pictorial representation in which students are asked to draw a picture of their understanding of the topic. The third stage is to link these systems of representation by having students talk about their thinking. The fourth step in the sequence is symbolic in which teachers make sure that students understand the symbols being used. The fifth and final stage moves the student into the abstract by asking if students can suggest other ways of solving the problem. Teachers should also be aware that if a student has a learning disability in reading that it will probably affect his or her math achievement especially when dealing with word problems.

Goldman, Hasselbring, and the Cognition and Technology Group at Vanderbilt (1997) provide solutions to the problem

of students with learning disabilities solving real-world problems through the use of technology. They feel that word problems in textbooks do not provide learning disabled students with the understanding of how mathematics can be used to solve real-world problems. In their instructional method which they call "anchored instruction" (p. 203), cognitive learning theory is delivered through the computer. These problem-solving strategies form webs of knowledge that the students can more quickly access. These problems are also used as motivation for students when they become more real to them. One suggestion for delivery of this approach is through the use of short video problems.

A review of the literature revealed many different methods of remediation and intervention in the area of mathematics. While no literature was found regarding problem of the day, teachers are often looking to try new strategies to increase student test scores.

CHAPTER 3

METHOD

SUBJECTS

Subjects were taken from two different public school districts, both in the same county of southeastern Ohio. All the subjects were in grades nine through twelve during the 1998-1998 school year and the ages ranged from fourteen to nineteen years of age. A total of thirty-eight subjects were used in this study, twenty-three females and fifteen males. The experimental group had nineteen students and the control group had nineteen students. The groups included students of average and below average mathematics abilities, as well as students with learning disabilities.

Subjects were selected for participation by the ex post facto method (Crowl, 1996). Students who not yet passed the mathematics portion of the Ohio Ninth Grade Proficiency Test who were in the lowest level math class from two different high schools in different districts, but in the same county, were chosen.

PROCEDURES

First, all students from the lowest level math classes from each of two different high schools in two different districts were looked at for participation. Their scores on

the mathematics portion of the Ohio Ninth Grade Proficiency Test given in October 1997 were obtained. Secondly, after looking at the proficiency test scores, the study was narrowed to those students in these two classes who had not yet passed the mathematics portion of the proficiency test.

The experimental group comprised of nineteen students was treated with a math problem of the day every day until the proficiency test was given again in March 1998 and the control group did not receive the treatment. Thus, the study lasted approximately five months.

DESIGN

The causal-comparative design (Crowl, 1996) of the study engaged a search of mathematics test scores from the proficiency test given in October 1997 for both groups. These scores provided pretest data for this study. The experimental group was treated with a problem of the day every day while the control group was not. This time the proficiency test math scores for the test given in March 1998 were obtained. These scores provided posttest data for this study.

INSTRUMENTATION

The Ohio Ninth Grade Proficiency Test was administered to the subjects by regular school faculty of the two participating school districts. All math portions were

machine scored. Data were collected from the pupil profile printouts.

All available reliability information on the Ohio Ninth Grade Proficiency Test was from the inception of the test given in Fall 1990, Spring 1991, Fall 1991, and Spring 1992. The Kuder-Richardson 20 reliabilities on the mathematics portion of these four tests ranged from .71 to .89, while the agreement index ranged from .82 to .85, the kappa index ranged from .48 to .71, and the standard error ranged from 6.84 to 7.12 (Mehrens & Ohio Dept. of Ed, 1993).

CHAPTER 4

RESULTS

Test results for the nineteen subjects in the control group were compared with the test results for the nineteen subjects in the experimental group. Scores from both the October 1997 and the March 1998 tests were compared. Also, the October 1997 scores were compared with the March 1998 scores dependently for both the control group and the experimental group to examine the achievement of each individual student.

OCTOBER 1997 SCORES: CONTROL VS. EXPERIMENTAL

October 1997 test results for the nineteen subjects in the control group were compared with the October 1997 test results for the nineteen subjects in the experimental group. An independent t test was used to analyze the data. As illustrated in Figure 1, there was no significant difference ($p < .05$) in the test results.

Figure 1.

Sample Size	Test Statistic, t	Critical t	Fail to Reject/ Reject
19	0.4208	± 2.1009	Fail to Reject

Based on these results, both the control group and the experimental group appear to be homogeneous at the beginning of the study. With a test statistic of 0.4208 these two groups appeared to have very similar test results of mathematical ability.

MARCH 1998 SCORES: CONTROL VS. EXPERIMENTAL

March 1998 test scores for the control group were compared with the March 1998 test scores for the experimental group. Once again, an independent t test was used to analyze the data and with an alpha level $p < .05$, no significant differences were found as indicated in Figure 2.

Figure 2.

Sample Size	Test Statistic, t	Critical t	Fail to Reject/ Reject
19	0.8048	$\pm$ 2.0281	Fail to Reject

After the experimental group received the problem of the day treatment and the control group did not, these two groups continued to produce similar test scores. The fact that no significant differences were found at the $p < .05$ level indicates that the strategy made no difference in test scores.

CONTROL GROUP: OCTOBER 1997 VS. MARCH 1998

October 1997 test scores for the nineteen subjects in the control group were compared with the March 1998 scores for the same group. A dependent t test was used to analyze the data. As illustrated in Figure 3, there was no significant difference ($p < .05$) in the test results.

Figure 3.

Sample Size	Test Statistic, t	Critical t	Fail to Reject/ Reject
19	-1.3442	± 2.1009	Fail to Reject

When pretest data from the control group was compared to posttest data for the same group, no significant differences were discovered at the $p < .05$ level. This indicates that students made little or no progress toward improving test scores from October 1997 to March 1998. Although thirteen students had increases in test scores, none of the nineteen students in the control group passed the test when given in March 1998.

EXPERIMENTAL GROUP: OCTOBER 1997 VS. MARCH 1998

October 1997 test scores for the experimental group were compared with their March 1998 test scores. Again an

independent t test was used for purposes of data analysis. With an alpha level $p < .05$ no significant differences were indicated (see Figure 4).

Figure 4.

Sample Size	Test Statistic, t	Critical t	Fail to Reject/ Reject
19	-0.4957	$\pm$ 2.1009	Fail to Reject

(Triola, 1988).

Both pretest and posttest results for the experimental group showed no significant advantages over similar results from the control group results above. These findings are like the results of the control group that indicate little or no progress toward improving test scores. One student passed the test when given in March 1998 while nine other students exhibited increased test scores.

CHAPTER 5

DISCUSSION

A review of the literature discussed areas of mathematics remediation and methods for improving test scores. While different strategies seem to work in specific areas, no significant differences were found in using the problem of the day technique.

Both the control group and the experimental group appeared to have similar mathematical skills as indicated by October 1997 test scores. While the experimental group was treated to a problem of the day every day for the approximately five months time period between the October 1997 and March 1998 tests, the control group received no special treatment other than the regular daily mathematics lesson. No significant differences were found in the March 1998 test scores when test scores for the control group were compared to test scores for the experimental group.

Possible reasons for a lack of notable differences between groups could be contrasts in teachers as well as their styles of teaching and years of experience. Consequently, the possibility cannot be ruled out that the findings of this study are due to unique characteristics of the students chosen for participation as opposed to the experimental teaching method described.

Further research should be performed by Ohio teachers to identify strategies and methods of remediation and intervention used in preparation for the Ohio Ninth Grade Proficiency Test. It is helpful to learn the methods that have been successful and those that have not been successful from other teachers in similar situations.

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APPENDIX A

STATEMENT OF CONSENT TO CONDUCT RESEARCH

To Whom It May Concern:

Catherine J. Heiney has been approved to conduct research for her Thesis submitted to Salem Teikyo University. This research includes Ohio Ninth Grade Proficiency Mathematics Test Scores for October 1997 and March 1998 which will be kept anonymous.

Superintendent
Frontier Local School District

Peter Conklin

Principal
Frontier High School

APPENDIX B

STATEMENT OF CONSENT TO CONDUCT RESEARCH

To Whom It May Concern:

Catherine J. Heiney has been approved to conduct research for her Thesis submitted to Salem Teikyo University. This research includes Ohio Ninth Grade Proficiency Mathematics Test Scores for October 1997 and March 1998 which will be kept anonymous.

George M. Dunn
Superintendent
Fort Frye Local School District

Robert A. Heinlein
Principal
Fort Frye High School

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